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# LYME DISEASE SURVEILLANCE SUMMARY

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BACTERIAL ZOOSES BRANCH  
DIVISION OF VECTOR-BORNE  
INFECTIOUS DISEASES  
CENTER FOR INFECTIOUS DISEASES  
CENTERS FOR DISEASE CONTROL

VOLUME 2 - : NO. 4

DATE: June 15, 1991

## Entomology, Vertebrate Ecology and the Lyme Disease Program at Fort Collins

The Lyme disease program at the Centers for Disease Control (CDC), Division of Vector-Borne Infectious Diseases (DVVID) in Fort Collins conducts research on major aspects of Lyme disease. In this issue of the LDSS, we feature Lyme disease projects underway in the Medical Entomology and Ecology Branch (MEEB).

All tick-related research (e.g., surveillance, species identification, vector competence assessments, disease transmission mechanisms, acaricide susceptibility and other control approaches) is performed by MEEB's Lyme Disease Vector Section. Zoonotic aspects of disease transmission, diagnosis in wild animals and control approaches related to vertebrate host management are undertaken by the Vertebrate Ecology Section.

## Colonies of *Ixodes dammini* From Various Geographic Areas Currently Maintained at CDC-Fort Collins

The Lyme Disease Vector Section has now established laboratory colonies of *Ixodes dammini* from Maryland, Massachusetts, New Jersey, New York and Wisconsin. Ticks from these colonies are currently undergoing taxonomic comparison and are being used in other Lyme disease research such as susceptibility testing of immature *I. dammini* to chemical control agents.

Acaricide bioassay trials were recently conducted using larvae and nymphs from Westchester County, New York. Three pyrethroid compounds (esfenvalerate, cyfluthrin, and permethrin) were compared with carbaryl using the disposable pipette technique. Results indicated that larvae and nymphs were most susceptible to permethrin, followed in order by cyfluthrin, esfenvalerate, and carbaryl. Larvae were 3-4 times more susceptible than nymphs. Baseline susceptibility values for other compounds are planned in order to monitor for the possible development of acaricide resistance.

## Availability of Permanone™ Tick Repellent in the United States<sup>1</sup>

Permanone has been tested and used as an insecticide and repellent for clothing and bednets for a number of years by the U.S. military. This product is now being offered to the public as a 0.5% spray solution of the active ingredient permethrin. It is reported to be a weather and wear resistant treatment for clothing which acts as both a repellent and an acaricide. Permanone is available as an unrestricted product in 28 states, as a restricted product in 7 states and is not registered for use in 15 states.

Permanone is registered for use in Kentucky only against the Lone Star tick. In Colorado, Georgia, and North Carolina it is registered for use against ticks only. It can be used in Rhode Island only by permit. Permanone is not sold in Massachusetts but can be used there if obtained from the manufacturer in Pennsylvania. The product is not approved for use or distribution in the following states: Alaska, Arizona, California, Hawaii, Idaho, Indiana, Kansas, Maine, Nebraska, Nevada, New York, South Dakota, Utah, Vermont and Washington. (Data from Ben Meadows Company.)

### Lyme Disease Research Projects on Field Ecology and Tick Control Funded by CDC.

Numerous field research projects on the ecology of Lyme disease are funded or are soon to be funded by CDC. Project oversight for these studies is provided by the Lyme Disease Vector Section and the Vertebrate Ecology Section of the DVBID at Fort Collins.

#### Current Projects

- Landscape Ecology of Ixodes dammini in Residential Communities, Westchester County, New York. Durland Fish, Ph.D. New York Medical College. Valhalla, NY. Cooperative agreement through New York Department of Health.
- Acaricide Trials for the Control of Ixodes dammini in Residential Areas. Durland Fish, Ph.D. New York Medical College. Valhalla, NY. Contract to NY Medical College.
- Studies to Determine the Tick Vector Species Responsible for Transmission of the Lyme disease Spirochete in the Southern United States. Daniel E. Sonenshine, Ph.D., Old Dominion University, Norfolk, VA, and Jay Levine, Ph.D., North Carolina State University, Raleigh, NC. Contract with Old Dominion University.
- Define Dispersal of Ixodes dammini and Borrelia burgdorferi to New Foci Along the Mississippi River. Uriel Kitron, Ph.D. University of Illinois Champaign-Urbana. Purchase order to University of Illinois.

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<sup>1</sup>Use of trademarks is for identification only and does not imply endorsement by the United States Public Health Service or the Centers for Disease Control.

Vertebrate Ecology of Lyme Disease in Pennsylvania. Rexford D. Lord, Ph.D. and Jan G. Humphreys, Ph.D. Contract with Indiana University of Pennsylvania.

#### New Projects (May 1991 - May 1992)

Determine Whether the Lyme Disease Spirochete Can Be Maintained on Islands off the Coast of New England Devoid of the Principal Reservoir Host, Peromyscus leucopus white-footed mouse). Robert P. Smith, M.D., and Peter W. Rand, M.D. Maine Medical Center, Portland, ME. Contract to Maine Medical Center.

Ecology of Lyme Disease in California. Robert S. Lane, Ph.D., University of California at Berkeley. Cooperative agreement with the University of California.

Ecology of Lyme disease in Georgia. James H. Oliver, Jr., Ph.D., Georgia Southern University. Subcontract of a cooperative agreement with the Medical College of Georgia.

Ecology and Control of Lyme Disease on Shelter Island. David Duffy, Ph.D., Seatuck Foundation. Cooperative agreement.

Control of Lyme Disease in New Jersey. Kenneth Spitalny, M.D., and Terry Schulze, Ph.D. New Jersey Health Department. Cooperative agreement.

Ecology and Control of Lyme Disease in New York. Lisa Patrican, Ph.D. Cornell University. Cooperative agreement.

Control of Lyme Disease in Westchester County, NY. Durland Fish, Ph.D., New York Medical College. Cooperative agreement.

Lyme Disease Ecology in the Upper Peninsula of Michigan. Richard W. Merritt, Ph.D. Subcontract of a Cooperative Agreement with the Michigan Department of Public Health.

Ecology of Lyme Disease in Virginia and North Carolina. Daniel E. Sonenshine, Ph.D., and Jay Levine, D.V.M. Subcontract to VA Department of Health Cooperative Agreement.

Entomologic and Vertebrate Ecology of Lyme Disease in Connecticut. Louis Magnarelli, Ph.D. Subcontract to Connecticut Department of Health Cooperative Agreement.

## National Lyme Disease Vector Distribution--Second Call for Contributions of Data

The Division of Vector-Borne Infectious Diseases is mapping the distribution of proven Lyme disease vector ticks by counties throughout the United States (LDSS, October 18, 1990). A data collection form was mailed to approximately 500 entomologists and public health personnel in November and December, 1990. To date, we have received 63 replies from 35 states. If you have material to contribute and have not done so or if you have not been contacted, please call Dr. Joseph Piesman (303) 221-6408 or Dr. William Paul (303) 221-6472 or write to either of them at CDC/DVBID, P.O. Box 2087, Fort Collins, CO 80522.

## Development of the Polymerase Chain Reaction for the Detection of *Borrelia burgdorferi* in Ticks.

The Molecular Bacteriology Section, DVBID is cooperating with the Lyme Disease Vector Section, DVBID to develop a routine polymerase chain reaction based detection system for *Borrelia burgdorferi* in ticks. Primers are used that target the *fla* and *ospA* genes of *B. burgdorferi*. We are investigating assay reproducibility, maximum tick pool size, optimizing sensitivity and eliminating the potential for contamination resulting in false positives. We expect to use PCR to detect *B. burgdorferi* in ticks as a routine protocol in the near future.

## Distribution of Lyme Disease Among Samples of Wildlife in Pennsylvania

Several research groups are studying the ecologic aspects of Lyme disease in Pennsylvania. The Indiana University of Pennsylvania initiated surveillance for the disease in nature in 1990 with sampling of small rodents and deer in selected counties in the state. Many of the sites utilized earlier have been revisited to investigate seasonal epizootiology.

Through May 1991 a total of 45 sites in 17 counties have been sampled (Adams, Armstrong, Berks, Cambria, Cameron, Clearfield, Cumberland, Dauphin, Elk, Franklin, Indiana, Jefferson, Lebanon, Perry, Schuylkill, Somerset, and Westmoreland Counties). Thirty-five isolations of *B. burgdorferi* have been made in BSK media from a total of 391 white-footed mice (*Peromyscus leucopus*). *B. burgdorferi* isolations have been made from mice or *I. dammini* ticks in Elk, Delaware, Lebanon, Berks, Cambria and Indiana counties. The Lebanon County isolation was from the Rausch Gap mountain valley of the Ridge and Valley System, an important geologic-topographic system extending in a broad band northeast to southwest through the middle of the state.

Because studies in Pennsylvania in 1990 strongly implicated mice in hemlock habitat as having high infection rates, efforts have primarily been directed to sites with hemlock; nevertheless, deciduous forest habitat is also being sampled. Results in 1991 confirm the importance of hemlock habitat in Pennsylvania (J. Wildlife Dis.--in press).

Of 550 samples of deer sera analyzed in 1990, 43 contained antibodies to *B. burgdorferi* using an ELISA method. The distribution of positive sera by counties follows:

**Deer Sera with Antibodies to *Borrelia burgdorferi* by County  
Pennsylvania, 1990**

County	Sera antibody positive	Total	Percent positive
Bucks	5	50	10
Clearfield	1	54	2
Delaware	8	52	15
Elk	10	100	10
Erie	13	80	16
Montgomery	4	40	10
Philadelphia	1	2	50
Unknown	1	1	100
<b>TOTAL</b>	<b>43</b>	<b>379</b>	<b>11</b>

*Ixodes dammini* ticks have been collected from each of the above counties.

Contributed by Rexford G. Lord, Ph.D., and Jan G. Humphreys, Ph.D., Indiana State University of Pennsylvania, Indiana, PA.

**Wallet Size Tick Identification Card**

The United States Army Medical Department has produced a wallet-sized information card showing color pictures of the ticks *Ixodes dammini* and *Dermacentor andersoni*, the vectors of Lyme disease and Rocky Mountain spotted fever respectively. An actual size black and white reproduction of the front and back of this card is shown below.

**LYME DISEASE**  
Deer Ticks May Carry Lyme Disease

**Common Symptoms:**  
Ring-shaped rash; flu-like symptoms and arthritis; later, disease affects joints, heart, and nervous system.

**Deer Tick (*Ixodes dammini*)**

Larva Nymph Female Male

**TICK-BORNE DISEASES**

**Deer Tick**

**Dog Tick**

Actual Sizes Shown Below

Inch Scale

**ROCKY MOUNTAIN SPOTTED FEVER (RMSF)**  
Dog Ticks May Carry RMSF

**Common Symptoms:**  
Spotted rash, high fever, chills, and severe headache.

**Dog Tick**

Larva Nymph Female Male

**EXPOSURE.** Organisms causing Lyme disease and RMSF are spread by tick bites. These diseases usually occur from spring through early fall.

**PREVENTION.** (1) Wear uniform with pants bloused into boots and sleeves down. (2) Apply repellent (DEET) to exposed skin. (3) Treat uniform with repellents such as permethrin, where available, or DEET. (4) Check yourself for ticks frequently and use buddy system. (5) Remove tick immediately with fine-tipped tweezers by grasping the tick as close to your skin as possible and gently pulling straight out. Do not squeeze the tick's body as this may inject fluid into you! Wash the bite area of skin and apply antiseptic.

**DIAGNOSIS & TREATMENT.** If you suspect Lyme or RMSF disease, seek medical care as soon as possible. Antibiotics can cure both diseases, but best results are achieved with early treatment.

*U.S. Army Medical Department — (7/89)*

Distribution of limited number of these cards will be made by CDC/DVBID to state and local health agencies upon request to Karen Peterson (303) 221-6453.

### **Reporting of Lyme Disease Cases in 1991 by NETSS**

The numbers of Lyme disease cases reported through NETSS in the period January through May are shown in Figure 1. Of the total 1,955 cases reported through Week 22, 1,489 (77%) were reported from the mid-Atlantic region. Upstate New York reported 1,068 cases (55% of the 1991 national total).

### **Erratum**

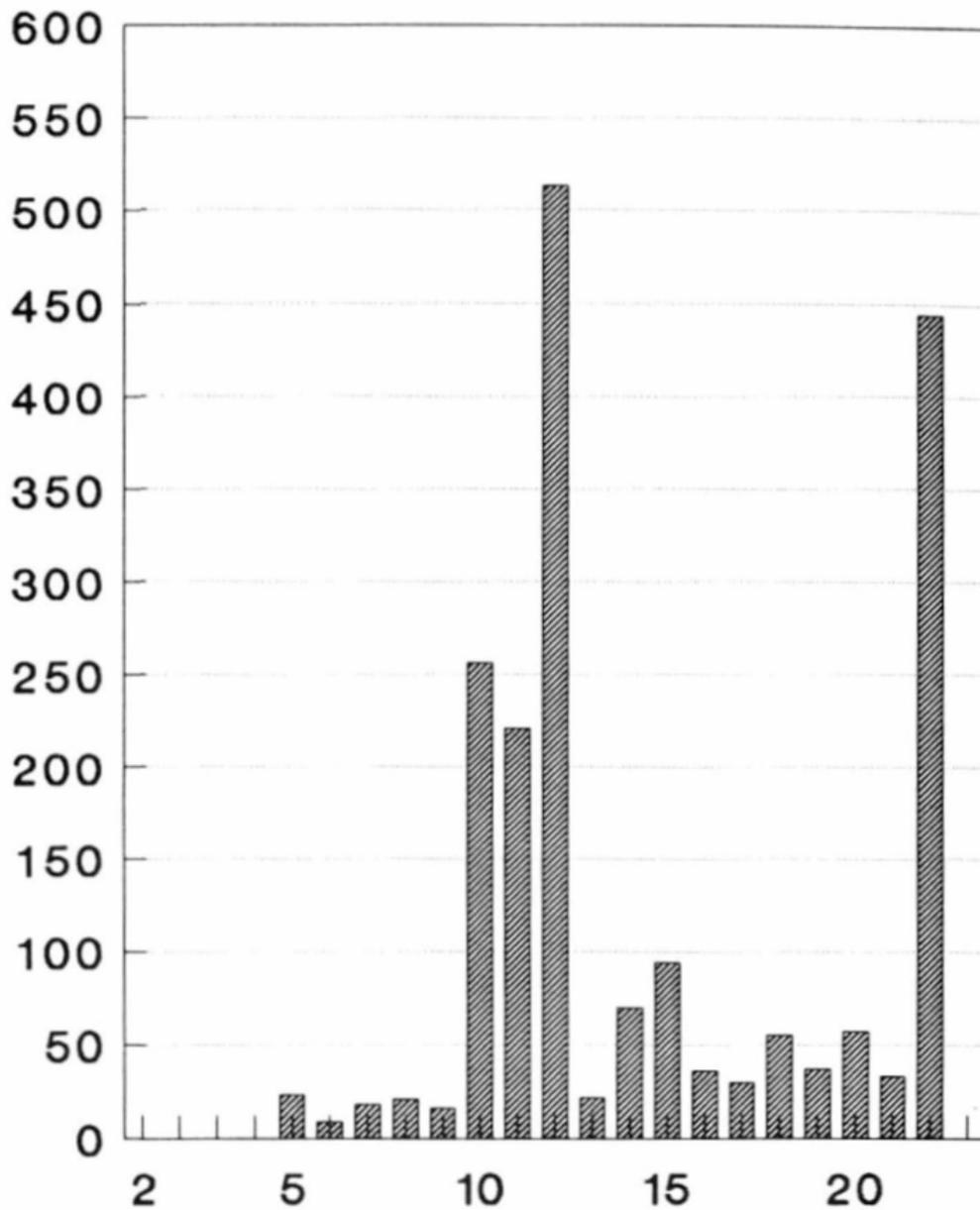
In LDSS Vol. No. 2, on pages 2 and 3, we erroneously attributed research cooperative agreements to the New York Medical Center. This should have read "The New York Medical College". We apologize for the mistake.

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Lyme Disease Surveillance Summary (LDSS) is edited by Drs. Robert Craven and David Dennis. If you have information to contribute or wish to receive a LDSS, please contact them at:

CDC/DVBID  
Lyme Disease Surveillance Summary  
P.O. Box 2087  
Fort Collins, CO 80522

# Cases



TOTAL = 1,955

25 30 35 40 45 50

Week